05. Variance component estimation via MLE

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1. Read the data "Ex4_1.csv", consisting of the yield measurement of three inbreed lines (assume all genotypes are independent and without pedigree information) in two environments. Please estimate the genetic variance component, environmental variance component, and genetic and environment interaction variance component, respectively, using restricted maximum likelihood (REML) estimation, and compare to the results using ANOVA last week.

2. Based on the above model, (*i*) please calculate the BLUP value of each genetic group, i.e. three inbreed lines, in the context of random effect. (*ii*) Please perform likelihood ratio test for the genetic and environment interaction effect. Is it significant at level α=0.01?

3. Read the data "Ex4_2.csv" for the nested mating design. (*i*) Please estimate the variance component of sire, dame nested in sire, respectively, using restricted maximum likelihood (RMEL) estimation, and compare to the results using ANOVA last week. (*ii*) Which accessions are full-sib and half-sib, respectively, in the nested mating design? Please estimate the variance component of additive effect and dominance effect based on the full-sib and half-sib resemblance (assume that there is no environmental effect).